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मानक

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Mazdoor Kisan Shakti Sangathan

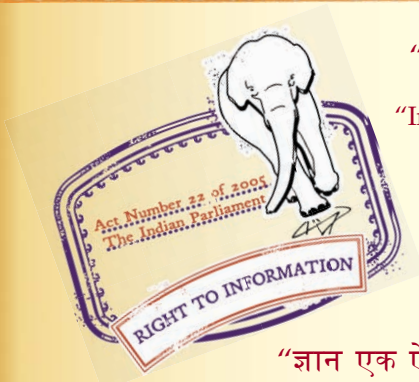
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 5500-2 (2004): Vibratory Roller - General Requirements, Part 2: Self-Propelled Single Drum [MED 18: Construction Plant and Machinery]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

कंपन रोलर — सामान्य अपेक्षाएँ

भाग 2 स्वतः नोदनित एकल ड्रम

(तीसरा पुनरीक्षण)

Indian Standard

VIBRATORY ROLLER — GENERAL REQUIREMENTS

PART 2 SELF-PROPELLED SINGLE DRUM

(*Third Revision*)

ICS 93.080.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Part 2) (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Mechanical Engineering Division Council.

The single drum vibratory rollers are versatile compacting machines and can be used for all types of soils and under various conditions. The success of vibratory rollers lies in their ability to compact a wide range of soils in deeper lifts and in less time than the conventional compacting equipment. The vibration induced to the soils reduces the friction between the particles of the material which are reoriented and brought closer together as air voids are eliminated, thus binding the material into denser state. Further compaction results from the static load and the centrifugal force applied by the vibrating roll on the material to be compacted. The total compacting force of a vibratory roller is, thus, significantly more than the mass of the machine.

This standard was first published in 1969 covering the general requirements for both self-propelled single drum and double drum (tandem) vibratory rollers. The first revision was taken up in 1977 to incorporate modification in the provisions relating to speed, fuel system, manufacture, etc. As a result of increasing use of different types of vibratory rollers in earthwork and road construction in our country, suggestions were received for preparing separate standards for vibratory rollers of single drum and tandem drum. Accordingly, the second revision of the standard was taken up in 1992 to cover only self-propelled heavy duty single drum vibratory rollers. Vibratory rollers have gone over various technical modifications in the last few years and need was felt to revise the standard to align it with current manufacturing practices.

In the preparation of this standard due consideration has been given to the provisions of *Central Motor Vehicles Rules*. However, this standard is subject to restrictions imposed under this Act, wherever applicable.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

VIBRATORY ROLLER — GENERAL REQUIREMENTS

PART 2 SELF-PROPELLED SINGLE DRUM

(Third Revision)

1 SCOPE

This standard (Part 2) lays down the requirements for material, size, design, construction and performance of self-propelled single drum vibratory roller.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated at Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Self-Propelled Single Drum Vibratory Roller — Self-propelled compaction machine with one vibrating metallic cylindrical body (drum) and a set of two rubber tyres powered with internal combustion engine. The engine provides power for both vibrations and movement.

3.2 Amplitude (Nominal) — It is expressed as half of actual vertical displacement when the drum is freely suspended and operating at rated frequency. It can be calculated by using the following formula:

$$A = (1\,000.m.r)/M$$

where

- A = nominal amplitude, in mm;
- m = eccentric mass, in kg;
- r = radius of eccentricity, in m;
- $m.r$ = eccentric moment; and
- M = vibrating mass, in kg.

3.3 Centrifugal Force — Force generated by vibrating mechanism at rated frequency. This is the product of the eccentric moment and the square of the angular velocity. To calculate the centrifugal force, following formula can be used:

$$F_c = 4\pi^2 (m.r)f^2$$

where

- F_c = centrifugal force, in Newton (N),
- $m.r$ = eccentric moment, in kg-m, and
- f = frequency of vibration in cycles per second (Hz).

3.4 Drum — A rotating cylindrical member used to transmit compaction force to soil or other surface.

3.5 Eccentric Moment ($m.r$) — The product of eccentric mass (m) and its radius of eccentricity (r).

3.6 Frequency (f) — The numbers of complete vibration cycles of the vibrating drum per second.

3.7 Gradability — The slope/ground angle at which the roller is able to start and travel at a constant speed on its own power on firm, hard and even sub-soil in forward and reverse direction with or without vibrations at rated frequency.

3.8 Ground Clearance — The vertical distance between a firm horizontal surface and the lowest point on the roller and not belonging to drum.

3.9 Static Linear Load — The static weight at the drum module divided by the width of the drum and is expressed as N/mm.

3.10 Non-vibrating Mass — The masses of all the parts that are supported on vibrating drum and not subjected to vibrations.

3.11 Operating Weight — The gross weight of the machine with all its standard accessories, operator weighing 75 kg, half full fuel tank, full hydraulic tank, lubricating and cooling systems and, when applicable, with unballasted tyres.

3.12 Pass — A one-way trip or passage of the roller. A round trip on the same path is considered two passes.

3.13 Resonant Frequency — The actual frequency at which the drum material combination exhibits the greatest amplitude; that is, when the generated frequency coincides with the natural frequency of the material being compacted.

3.14 Shipping Weight — The weight of the machine as shipped by the manufacturer. This should correspond to the weight of the machine without operator, with hydraulic, lubricating and cooling system filled, fuel tank filled to its 10 percent capacity, and with or without cab, canopy as stated.

3.15 Drum Module Weight — The portion of the operating weight exerted on the ground through the drum.

3.16 Surface Load — This is only applicable to roller equipped with pad foot drum. This is the ratio of static weight on the drum and the total contact area of the minimum number of feet which simultaneously come in contact with level ground without penetrating and is expressed in N/mm^2 .

3.17 Turning Radius (Inner) — The radius of the circle described by the inner edge of the rear wheel or tyre when the machine is executing its sharpest practicable turn without vibrations (see Fig. 1).

3.18 Turning Radius (Outer) — The radius of the circle described by the outer edge of the front drum when the machine is executing its sharpest practicable turn without vibrations (see Fig. 1).

3.19 Turning Circle — The diameter of the circle, which will enclose the outermost projection of the roller with all its basic equipment while executing its sharpest practicable turn (see Fig. 1).

3.20 Vibrating Mass (M) — The mass of the vibrating drum along with the mass of all other parts which are directly mounted on the drum including up to vibration isolators.

3.21 Volume Capacity — It is calculated from the following formula:

$$Q = C.W.V.H.1000/n \text{ m}^3/h.$$

where

- C = assumed efficiency factor
- = practical capacity/theoretical capacity;
- W = drum width, in m;
- V = roller speed, in km/h;
- H = layer thickness after compaction, in mm; and
- n = number of passes.

4 COMPONENT NOMENCLATURE

The nomenclature of the major components of the roller is shown at Fig. 2.

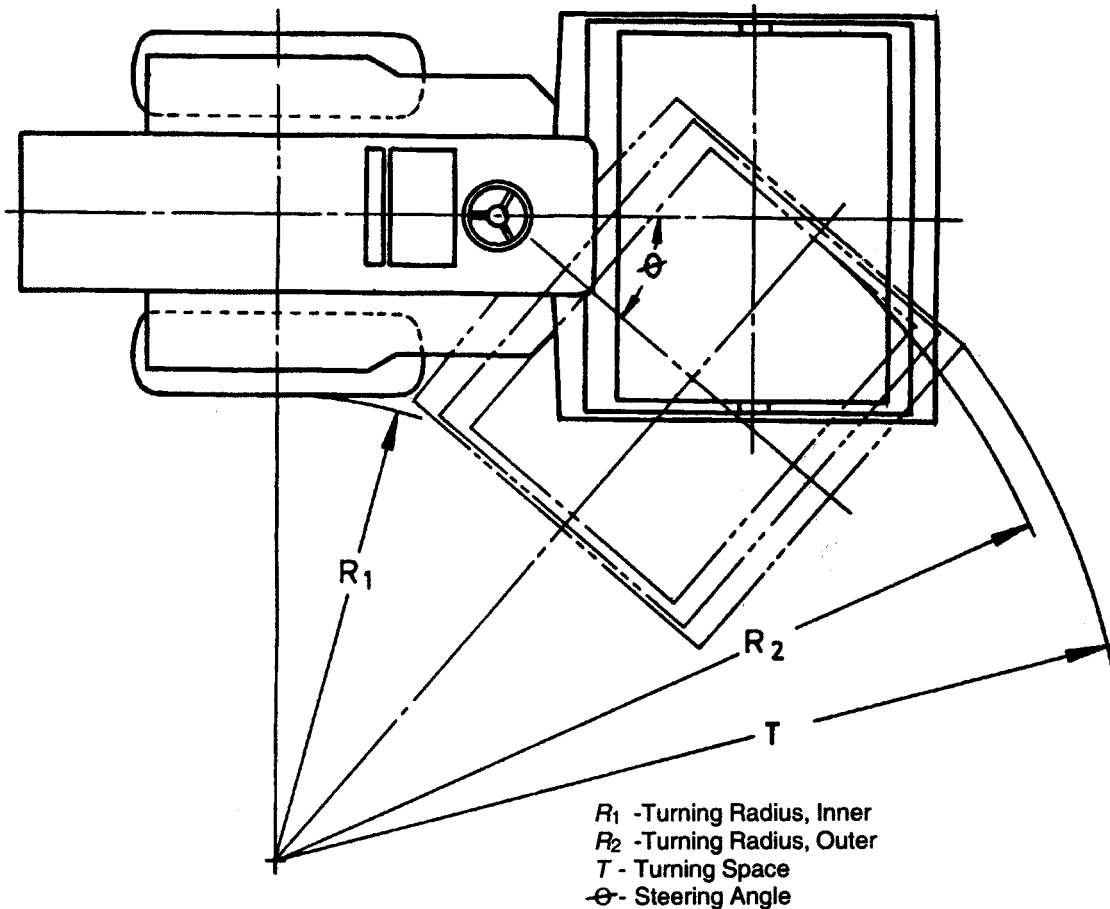


FIG. 1 TURNING RADII OF SELF-PROPELLED SINGLE DRUM VIBRATORY ROLLER

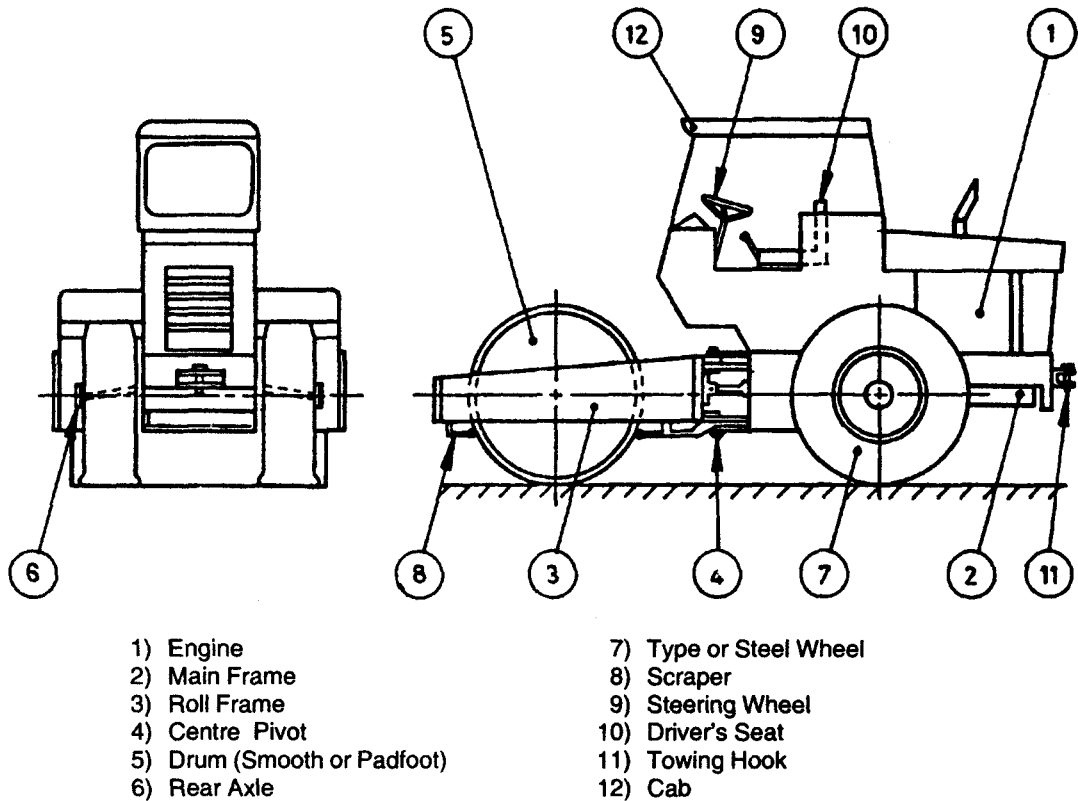


FIG. 2 COMPONENT NOMENCLATURE OF SELF-PROPELLED SINGLE DRUM VIBRATORY ROLLER

5 DIMENSIONS

The main dimensions of the roller are illustrated at Fig. 3.

6 DESIGNATION OF SIZES

The size of the roller shall be specified in terms of the operating weight of the equipment. These shall be of the following sizes:

- a) 2 to 4 t,
- b) 4 to 6 t,
- c) 6 to 8 t,
- d) 8 to 10 t,
- e) 10 to 12 t and
- f) 12 t and above.

The operating weight (*see 3.11*) shall be within ± 10 percent of the specified value.

7 MATERIALS

7.1 The materials used for construction of the roller shall comply with the requirements given at **7.1.1** to **7.1.10**.

7.1.1 Steel Plates, Bars and Sections

These shall conform to IS 2062 or IS 8500.

7.1.2 Steel Sheets

These shall conform to IS 513 or IS 1079.

7.1.3 Steel Castings

These shall be of suitable grade conforming to IS 1030 or IS 2644 or IS 2708.

7.1.4 Spheroidal Grey Iron Castings

These shall be of suitable grade conforming to IS 1865.

7.1.5 Grey Iron Castings

These shall be of suitable grade conforming to IS 210 or IS 6331.

7.1.6 Carbon and Alloy Steel Components

These shall be manufactured from suitable grade of steels conforming to IS 1875 or IS 3930 or IS 4432. In case of carbon steel forgings, these shall be of suitable class conforming to IS 2004.

7.1.7 Springs

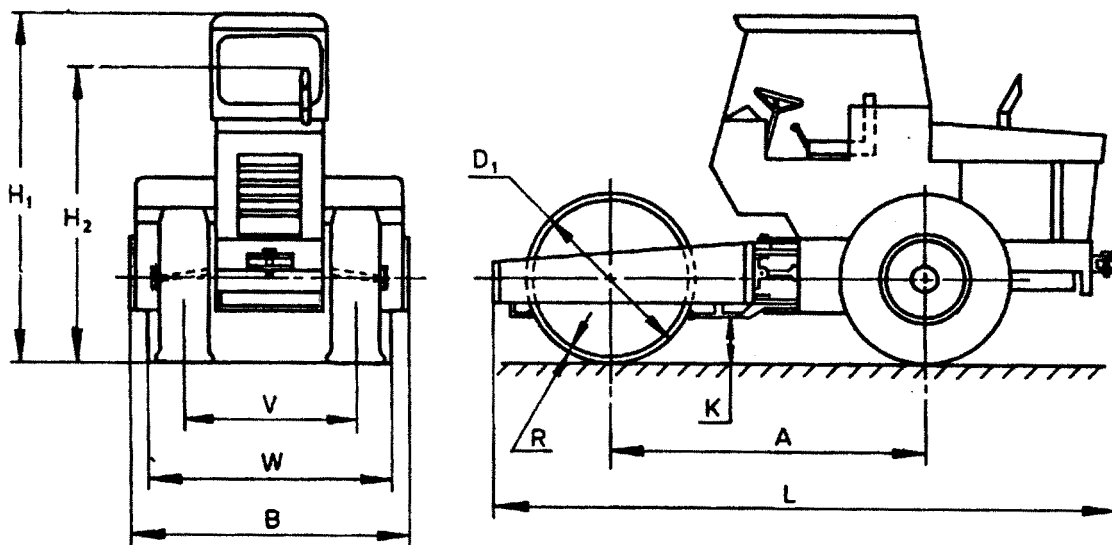
These shall be manufactured from suitable grade of wire conforming to IS 4454 (Part 1) or IS 4454 (Part 2).

7.1.8 Rivet Bars

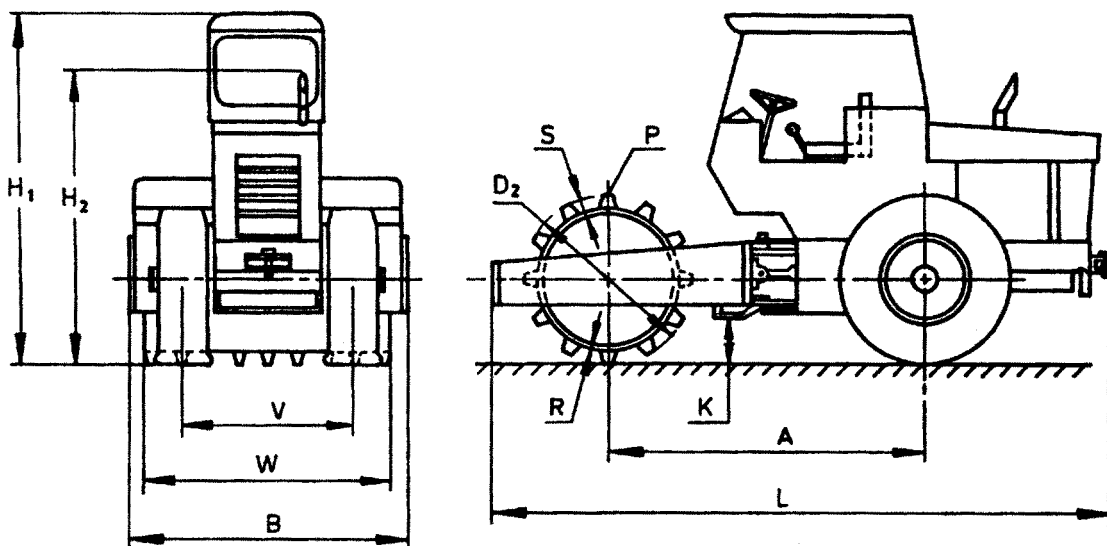
These shall conform to IS 1148.

7.1.9 Steel Tubes

These shall conform to IS 1239 (Part 1).



Smooth Drum Roller



Padfoot Drum Roller

- | | |
|--|--------------------|
| A - Wheel Base | L - Length Overall |
| D - Width Overall | P - Number of Pads |
| D ₁ - Drum Diameter (Smooth) | R - Rim Thickness |
| D ₂ - Drum Diameter (Padfoot) | S - Height of Pads |
| H ₁ - Height with Cab | V - Wheel Track |
| H ₂ - Height without Cab | W - Roll Width |
| K - Ground Clearance | |

FIG. 3 MAIN DIMENSIONS OF SELF-PROPELLED SINGLE DRUM VIBRATORY ROLLER

7.1.10 V-belts

V-belts for belt drives shall conform to IS 2494 (Part 1).

7.2 Any other material used for components of roller shall conform to its relevant Indian Standard, if available, or as agreed to between the purchaser and the supplier.

7.3 The standard brought-out parts used on the roller shall conform to relevant Indian Standards.

8 CONSTRUCTION

8.1 The construction of the machine in general shall be strong and capable of withstanding continuous operation over rough, rocky or soft surface.

8.1.1 The design and construction of the machine shall be such as to isolate and dampen all parts from the vibrating drum by provision of effective anti-vibration mounts and other suitable means.

8.1.2 All parts of the machine requiring frequent replacement, regular attention and periodic maintenance shall be easily accessible with minimum dismantling of any fittings or parts.

8.1.3 The parts of the machine which are exposed to atmosphere and are liable to become defective due to continuous exposure to dust and weather shall be covered/protected adequately by proper coatings.

8.2 Frame

The frame of the machine shall have two parts — tractor module and drum module. These two parts shall be connected through centre pivot that permits articulation and oscillation between the two parts.

8.2.1 Tractor Module

The engine, radiator (if used), main transmission system, drive axles (if used), fuel and hydraulic tanks and other connected components shall be installed on the main frame. The main frame shall be made of structural steel with deep rolled section or pressed steel channels (or other suitable sections) or fabricated from steel plates.

8.2.2 Drum Module

The vibratory drum (roll) along with the vibratory mechanism and its drive system shall be mounted on the roller frame through anti-vibration mountings to ensure that vibrations are adequately isolated from the frame and other parts of the machine so as not to cause discomfort to the roller operator. The roller frame shall be fabricated from structural steel conforming to IS 2062 or IS 8500 with rolled steel plates, pressed steel channels or other steel sections. The drum may be fabricated by welding.

8.2.3 Centre Pivot/Articulation Joint

Centre pivot/articulation joint assembly shall be so designed that the roller frame can articulate as well as oscillate. It shall be fitted with adequate size of suitable bearings to facilitate the articulation and oscillation of the roller frame.

8.3 Vibratory Drum

The vibratory drum may be smooth or pad foot and shall be fabricated from heavy steel plates and electrically welded. The drum design shall incorporate proper internal strengthening arrangement providing maximum resistance to vibratory stresses and overall drum stability. In case of pad foot drum, the pads shall be made of manganese steel castings of suitable grade conforming to IS 2708. The pads shall be electrically welded to the drum.

9 VIBRATORY MECHANISM

9.1 The vibratory mechanism employed on the drum shall consist of eccentric weights fitted on a shaft, which rotates at high speed on the drum axis and is supported on bearings inside the drum shell. The hydraulic motor directly coupled to the shaft shall drive this shaft.

9.2 The vibratory mechanism shall work independent of the drum drive, if used, with independent controls for starting and stopping the vibration.

9.3 Vibration Characteristics

The design of the vibratory mechanism shall be such as to provide the desired frequency and matching amplitude of vibration to the vibrating drum.

9.3.1 A machine suitable for compaction of soil and granular layers may have frequency between 20 to 40 Hz (1 200 to 2 400 vibrations/min) and amplitude between 0.4 to 2.0 mm.

NOTE — Manufacturer may indicate single or multiple frequency and amplitude.

10 ENGINE

10.1 The prime mover shall be diesel engine conforming to IS 10001 or IS 10002. The engine shall have adequate power, capable of operating the machine in the conditions given in 10.1.1 and 10.1.2. Intermittent rating of the engine can be considered based on the actual equipment requirement.

10.1.1 The roller shall be capable of operating satisfactorily without damage to any component while working under following atmospheric conditions:

- a) Ambient temperature between: -5°C and 50°C for altitudes up to 1 000 m; and
- b) 20 to 100 percent relative humidity at any temperature up to 29°C .

10.1.2 The roller shall be capable of performing to its specifications up to 1 000 m altitudes, above mean sea level. For altitude above 1 000 m and extreme temperature conditions, engine with adequate power shall be used based on the following operating conditions to be specified by the purchaser:

- a) Maximum altitude at site,
- b) Minimum and maximum ambient temperature at site, and
- c) Minimum and maximum relative humidity at site.

10.2 The engine shall be provided with 12 V/24 V electric system.

10.3 The engine shall be provided with a suitable size of alternator so as to keep the battery charged even when the roller is used at night with entire illumination system.

11 FUEL SYSTEM

The fuel tank shall be of sufficient capacity to provide a minimum of 10 h of normal operation of the roller under conditions as specified at 10.1.1, 10.1.2 and 10.3. The fuel-filling orifice shall incorporate a removable filter and shall be so designed and so placed that filling by jerry-cans without the aid of funnel, presents no difficulty. A captive lockable filler cap shall be provided for the filling orifice and the method used for venting the tank to atmosphere shall be such that no fuel spillage occurs when the machine is travelling with the tank completely full. The filler cap shall be such that it will not permit rainwater inside the fuel tank. A plug shall be provided for completely draining the tank. A calibrated fuel gauge or dipstick shall be provided. Fuel filters of adequate capacity for operating conditions as specified at 10 shall be provided in the system.

12 RADIATOR

A radiator of adequate capacity shall be provided for water-cooled engines as recommended by prime mover manufacturers to keep the temperature of the coolant always within the optimum operating temperature of the engine and within the permissible limits. The radiator shall be resiliently mounted to withstand shocks transmitted through the frame. A drain tap shall be provided in the radiator.

13 TRANSMISSION

13.1 The drive may be only through tractor module or both tractor and drum module. The power from the prime mover shall normally be transmitted to the rear wheels of the machine hydraulically through pumps and motors. The hydraulic transmission should usually incorporate hydrostatic drive arrangement using variable displacement pump and variable or fixed displacement motor. In case of drum drive type machine combined hydraulic drive shall also be provided for the drum in addition to the wheel drive. The design of the hydraulic transmission shall be such that the machine can be towed in case of emergency.

13.2 Speed

The machine shall be provided with a minimum of two-speed range in forward and reverse direction; the lower speed range for operation during compaction and the higher speed range for movement from one work site to the other. The lower speed range shall be between 0 to 8 km/h and the higher speed range between 0 to 23 km/h. The machine with pad foot drum shall have only the working speed range, that is, the lower speed range.

14 STEERING

14.1 The machine shall have articulated steering hydraulically powered with double acting hydraulic cylinders acting about the centre pivot/articulation joint and actuated by steering wheel. The minimum steering (articulation) angle on either side of the machine shall be 30°. The minimum oscillating angle of the drum assembly about the horizontal plane shall be $\pm 7^\circ$.

14.2 If there is any failure of the diesel engine the steering system shall be able to provide manual steering.

15 HYDRAULIC SYSTEM

15.1 The hydraulic oil tank shall be of sufficient capacity to meet the demands of the complete hydraulic system of the roller. The tank shall have suitable arrangements to avoid ingress of dust and shall be fitted with suitable air breather and filler arrangement. The tank shall be fitted with level gauge indicating desirable oil level.

15.2 The maximum allowable temperature of the hydraulic oil and the connected components shall be within the limits as specified by the manufacturer. If required, suitable oil cooler is to be provided in the hydraulic system to keep the oil temperature within the permissible limit.

16 BRAKES

16.1 Service Brake

The machine shall be provided with hydrostatic/foot or hand-operated pneumatic/hydraulic or air-intensified hydraulic brake arrangement.

16.2 Parking Brake

This shall be either hand-operated mechanical brake system at the transmission output shaft/connected to the rear axle/wheel service brakes or self-energizing hydraulically released type.

17 TYRES AND WHEELS

The rear axle/wheels of the machine shall be fitted with pneumatic tyres of appropriate size and tread pattern so as to provide adequate traction and

floatation while operating on various surfaces. For machines used for compaction of asphalt/bituminous materials smooth pattern tyres shall be fitted at the rear axle/wheels.

18 GRADABILITY

The engine as well as the braking system shall be suitable to ensure that the machine shall be safely operated with/without vibration up to a gradient of 3 in 10 on the surface as specified at 3.6.

19 SCRAPERS

Scrapers to act in either direction shall be fitted on the roller frame to clean/scrap the drum surface. The scrapers shall cover the full width of the drum and shall be set against them. Adjustment for wear of the scraper shall be provided.

20 OPERATORS SEAT

An adjustable and comfortable seat shall be provided for the driver.

21 CANOPY AND CAB

If required by the purchaser, a suitable canopy or cab shall be provided on the machine.

21.1 Canopy

This shall have a basic structure with upright support posts with the top covered with canvas or other suitable materials.

21.2 Cab

The operators cab shall be totally enclosed type. The cab shall be of fabricated steel structure with toughened glass panels in all window and door apertures. The cab shall be provided with lockable door and windscreen wipers at the front and rear. The cab ceiling shall be properly heat insulated.

22 FITMENT OF REFLECTORS

A suitable reflector shall be fitted to the machine.

23 CONTROLS

23.1 Following controls shall be provided and shall be easily accessible to the operator:

- a) Engine starting switch;
- b) Engine stop control lever or pull cable;
- c) Engine speed control lever;
- d) Steering wheel;
- e) Forward and reverse lever for transmission (hydrostatic transmission);
- f) Transmission high or low range control (hydrostatic transmission);
- g) Vibration control switch or lever or pedal;
- h) Service brake lever/pedal;
- j) Parking brake hand lever, only if self-energizing brakes are not provided;

- k) Wiper control (if fitted); and
- m) Lighting controls.

23.2 Following instruments and gauges shall be provided on the dashboard of the machines:

- a) Engine oil pressure gauge;
- b) Engine water temperature gauge, if water cooled engine is used;
- c) Air pressure gauge, if provided;
- d) Battery charging warning lamp/ammeter/voltmeter;
- e) Speedometer, if required;
- f) Hour meter;
- g) Push button switch for horn;
- h) Engine rpm meter (optional);
- j) Lubricating oil temperature gauge if air cooled engine is used; and
- k) Belt failure indicating lamp or audible warning device if air cooled engine is used.

24 LIFTING AND TOWING ARRANGEMENTS

24.1 The machine shall be fitted with suitable means for lifting by slings and crane.

24.2 Arrangement of towing shall be provided at the front and rear end of the machine.

25 LUBRICATION

Adequate lubrication of all moving parts shall be provided.

26 SAFETY REQUIREMENTS

26.1 Safety guards shall be provided for the moving parts wherever required.

26.2 The minimum ground clearance shall be:

- a) 150 mm, minimum for rollers up to 4 t; and
- b) 300 mm, minimum for rollers above 4 t.

The ground clearance shall not be less than 300 mm.

26.3 A rear view mirror shall be provided to enable the operator to see the incoming vehicles and other objects behind the machine.

26.4 Lights at front and rear, at near and offside of the machine shall be provided to show the presence of machine at night to the other vehicles using the road.

26.5 Two headlights at the front and stoplight at the rear shall be provided for travelling at night.

26.6 Electrically operated horn shall be provided in the machine.

26.7 If required by the purchaser, suitable floodlights shall be fitted on the machine for operation during night.

26.8 As specified in IS 12239 (Part 1), the outlet of the exhaust pipe shall be located in such a way that the

driver or any other operator obliged to stand on the machine shall not normally be exposed to harmful concentration of noxious gases or fumes.

27 FINISHING

27.1 All exposed parts of the machine shall be cleaned, treated and painted with suitable anti-corrosive protective paint, conforming to the relevant Indian Standards.

27.2 All electrical cables and hydraulic hoses used in the machine shall be properly tied or clamped to avoid damage during operation.

28 TOOLS AND INSTRUCTION MANUALS

28.1 Tool Box

A strong tool box with a lock and key shall be provided with the machine. It shall contain the necessary tools for normal running, adjustments and lubrication of the machine.

28.2 Operator's Manual

An operator manual with instructions for operation, routine/preventive maintenance, servicing, selection of lubricants, hydraulic oil and brake fluid shall be furnished with each machine. A spare parts book shall also be provided with the machine.

29 MARKING

29.1 Rating Plate

Each machine shall have a rating plate firmly attached to either drum or tractor module where it can be easily read and shall not be easily removed. The plate shall have clearly marked on it the following information:

- a) Manufacturer's name and address;
- b) Model;
- c) Machine serial number;
- d) Year and month of manufacture;
- e) Operating weight; and

- f) Engines make, serial number, horse power and rev/min.

29.2 The required inflation pressure of the tyres shall be marked on appropriate place near the tyres.

29.3 Instruction and Warning Plates

The machine shall have permanently affixed to it; and suitably located instruction and warning plates/stickers indicating precautions and any special or important procedures to be observed in operation and servicing the equipment.

30 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

The following information shall be furnished by the manufacturer:

- 1) Operating weight;
- 2) Engine specification;
- 3) Forward and reverse speed;
- 4) Static load;
- 5) Linear/surface load;
- 6) Rolling width;
- 7) Diameter of drum;
- 8) Frequency of vibration (range);
- 9) Nominal amplitude(s);
- 10) Centrifugal force at rated speed;
- 11) Ground clearance;
- 12) Steering angle;
- 13) Oscillation angle;
- 14) Turning radii (inner and outer);
- 15) Turning circle;
- 16) Wheel base;
- 17) Overall length;
- 18) Overall width;
- 19) Overall height;
- 20) Gradability;
- 21) Tyre inflation pressure;
- 22) Fuel tank capacity;
- 23) Hydraulic tank capacity; and
- 24) Sprinkler tank capacity, if provided.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
210 : 1993	Grey iron castings — Specification (<i>fourth revision</i>)	2708 : 1993	1.5 percent manganese steel castings for general engineering purposes (<i>third revision</i>)
513 : 1994	Cold-rolled low carbon steel sheets and strips (<i>fourth revision</i>)	3930 : 1994	Flame and induction hardening steels (<i>second revision</i>)
1030 : 1998	Carbon steel castings for general engineering purposes (<i>fifth revision</i>)	4432 : 1988	Case hardening steels (<i>first revision</i>)
1079 : 1994	Hot-rolled carbon steel sheets and strips (<i>fifth revision</i>)	4454 (Part 1) : 2001	Specification for steel wires for mechanical springs: Part 1 Patented and cold drawn steel wire — Unalloyed (<i>third revision</i>)
1148 : 1982	Hot-rolled rivet bars (up to 40 mm dia) for structural purposes (<i>third revision</i>)	4454 (Part 2) : 2001	Specification for steel wires for mechanical springs: Part 2 Oil hardened and tempered spring steel wire and valve spring wire (<i>second revision</i>)
1239 (Part 1) : 1990	Mild steel tubes, tubulars and other wrought steel fittings — Specification: Part 1 Mild steel tubes (<i>fifth revision</i>)	6331 : 1987	Automotive grey iron castings (<i>first revision</i>)
1865 : 1991	Iron castings with spheroidal or modular graphite (<i>third revision</i>)	8500 : 1991	Structural steel — Micro-alloyed (medium and high strength qualities) — Specification (<i>first revision</i>)
1875 : 1992	Carbon steel billets, blooms, slabs and bars for forgings (<i>fifth revision</i>)	10001 : 1981	Performance requirements for constant speed compression ignition (diesel) engines for general purposes (up to 20 kW)
2004 : 1991	Carbon steel forgings for general engineering purposes (<i>third revision</i>)	10002 : 1981	Performance requirements for constant speed compression ignition (diesel) engines for general purposes (above 20 kW)
2062 : 1999	Steel for general structural purposes — Specification (<i>fifth revision</i>)	12239 (Part 1) : 1996	Guide for safety and comfort of operator of agricultural tractors and power tillers: Part 1 General requirements (<i>first revision</i>)
2494 (Part 1) : 1994	V-belts — Endless V-belts for industrial purposes: Part 1 General purpose — Specification (<i>second revision</i>)		
2644 : 1994	High tensile steel castings (<i>fourth revision</i>)		

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Telephones : 2323 0131, 2323 33 75, 2323 9402

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	{ 2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700 054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160 022	{ 60 3843 60 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600 113	{ 2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400 093	{ 2832 9295, 2832 7858 2832 7891, 2832 7892
Branches	: AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.	